the United States of America, where, by their munificent donations, counting by millions, they have covered the land with a net-work of universities which have brought higher education within the reach of almost every citizen. I hope the time is coming when men who have more than they want, more, perhaps, than is good for them, can find no better opportunity of disposing of the surplus than by benefactions which not only are of present usefulness, but, what is of more importance, are of permanent advantage to the community amongst which they live."

On Thursday last, December 1, the prizes and certificates gained by students of the Sir John Cass Technical Institute during the session 1903–4 were distributed by Sir William White, K.C.B., F.R.S., when the chair was taken by Sir Owen Roberts, chairman of the governing body. Sir William White, in the course of his address, said that during his recent visit to America he had had the opportunity of studying the methods of technical education in vogue there, and he must certainly confess that both America and Canada can teach us a great deal so far as technical colleges in general, and the interest taken by employers of labour in the future employment of men trained in technical institutions, is concerned. The essential advantage which America and Canada, and also Germany, possess over this country is that they are all imbued with the idea that it is a wise investment on the part of a nation to provide for all kinds of education from the elementary up to the highest. It is almost impossible to make expenditure on education too lavish, provided it is well directed, if the nation is to be well educated. This country, in his opinion, will never reach a truly healthy condition until every man or woman, in whatever position the accident of birth may place them, shall, if they possess the capabilities, have also the opportunities of self-culture. Nevertheless, there is one respect, he thought, in which this country stands supreme. It is in the provision of evening classes for the working man and the working woman who, from the very nature of their circumstances, are compelled to work all day to get a living. Employers should assist these educational classes more than they do at present. The London and South-Western Railway Company are doing what may well be done by other large employers. They grant to the apprentices in their works at Nine Elms the necessary time to attend the early morning classes at the Battersea Polytechnic. The apprentices are allowed to go to these classes twice a week, and are paid for the time that they are away from the company's service, on the condition that they do a certain amount of study at home, thus completing in the evening the training which they receive during the day at the polytechnic. This is not altogether an experiment. The Admiralty has done the same thing for fifty years or more, with the result that the Admiralty, from the apprentices in its own dockyards, has trained not only many of its principal shipbuilding officers and naval architects for the Royal dockyards and the Admiralty service, but has also furnished to the private shipbuilding industry of the country some of its most famous shipbuilders. The leaders and managers in those great private establishments to-day are in no small proportion drawn from men who were trained in the Admiralty service under the system which has been in operation, and by which every apprentice who cares to improve his mind has the opportunity to do so. If employers will give the utmost encouragement to institutions like the Sir John Cass Institute, they will be rewarded by having capable men on their staff who will know the principles of their business.

SOCIETIES AND ACADEMIES.

London.

Royal Society, November 17.—"The Electrical Conductivity and other Properties of Sodium Hydroxide in Aqueous Solution, as Elucidating the Mechanism of Conduction." By W. R. **Bousfield,** K.C., M.P., and T. M. **Lowry,** D.Sc.

The original object of the research was to investigate the decay, as the temperature rises, in the "ionising" properties of water, which is manifest in the inflected character of the curves expressing the relation between temperature and conductivity in aqueous solutions of the alkalies.[1] The principal results of the investigation are as follows:—

(1) In the most dilute solutions, in which "ionisation" is nearly complete, and again in the most concentrated solutions, the curves expressing the relation between molecular conductivity and temperature in aqueous solutions of sodium hydroxide are not inflected between 0° C. and 100° C. In each case the form of the curve appears to be determined mainly by the rapid changes of viscosity which accompany changes of temperatures. Moderately dilute solutions give curves that are inflected between 0° C. and 100° C.; the temperature of inflection reaches a minimum, at 48° C., in the case of a normal (4 per cent.) solution, but rises to 100° C. when the concentration is raised to 30 per cent.

(2) The inflected conductivity-temperature curves can be represented by the formula

$$\kappa_t/\kappa_0 = \rho_v/\rho_0\,(1+bt)^n\,e^{-at}.$$

This formula is applicable to conductivity-temperature curves of all kinds, and gives expression, not only to the inflection now under consideration, but also to the maximum conductivity and the second inflection in the general conductivity-temperature curve.[2]

(3) The maximum conductivity of caustic soda at 18° C. is 0·3490 in a 15 per cent. solution, the value given by Kohlrausch being 0·3462. At higher temperatures the maximum conductivity is considerably greater, rising to more than 1·4 at 100° C., and occurs in solutions of greater concentration.

(4) The viscosity of a 50 per cent. solution of sodium hydroxide is approximately seventy times as great as that of water. The influence of this factor may be to some extent eliminated by dividing the molecular conductivity by the fluidity, and this ratio it is proposed to call the "intrinsic conductivity" of the solution. Whilst the molecular conductivity of sodium hydroxide solutions decreases steadily as the concentration is increased, the intrinsic conductivity falls to a minimum at about 8 per cent. NaOH, and then rises, until at 50 per cent. NaOH, the value is considerably greater than in the most dilute solutions. It is believed that this increase is due to the fact that liquid soda is an electrolyte, *per se,* and that, in concentrated solutions, the current is conveyed partly by the soda alone, as if it were in the fused state.

(5) In re-determining the densities of aqueous solutions of sodium hydroxide, quantities of sodium, amounting to about 150 grams at a time, were weighed, and converted quantitatively into concentrated solutions of sodium hydroxide by the action of steam in a platinum vessel. Eleven determinations, made with six different standard solutions, gave, as the density of a 50 per cent. solution at 18° C., the value 1·5268, with an average error of 0·0001. Solutions of known concentrations having been prepared by dilution, their densities were determined with a probable error of not more than 0·0001; the values recorded by previous observers were derived from solutions standardised by titration only, and appear to contain errors in the third or even in the second place of decimals.

(6) In the formula

$$\rho_t = \rho_0 + \alpha t + \beta t^2 + \gamma t^3,$$

which represents the influence of temperature on the density of water and aqueous solutions of soda, the coefficient of t^3 vanishes when a concentration of 12 per cent. NaOH is reached, whilst the coefficient of t^2 vanishes at 42 per cent. NaOH; at the latter concentration there is a simple linear relationship between density and temperature.

(7) The molecular volume of sodium hydroxide in dilute aqueous solution has a large negative value, a litre of water dissolving 140 grams of sodium hydroxide at 0° C., 100 grams at 18° C., or 60 grams at 50° C., without increasing in volume. The molecular volume does not increase continuously as the temperature rises, but reaches a maximum value at about 70° C. In a 50 per cent. solution the temperature has little effect on the molecular volume, the extreme variation being only about 10 per cent.

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[1] Compare Roy. Soc. *Proc.*, 1902, vol. lxxi. pp. 42–54.

[2] *Loc. cit.*, p. 52.

Entomological Society, November 16.—Prof. E. B. Poulton, F.R.S., president, in the chair.—Mr. H. St. J. **Donisthorpe** exhibited the second recorded British specimen of *Orchestes sparsus,* Fahr., taken by him on August 28 in the New Forest.—Mr. H. W. **Andrews** exhibited specimens of *Atherix crassipes,* Mg., from the New Forest, the only previously recorded locality in Britain being near Ticehurst, Sussex.—Mr. G. O. **Sloper** exhibited aberrant forms of *Melitaea athalia* from Luan, Switzerland, and Martigny, in which the tendency of the black markings to supersede the fulvous was particularly noticeable.—The **President** exhibited cases containing Diptera, and a case containing the skins of African Sphingid larvæ, dried in botanical paper, and after seventy years still preserving their colours, from the Burchell collection in the Hope Museum, Oxford.—Mr. C. O. **Waterhouse** exhibited a gall of some lepidopterous insect found on the califate bushes in Patagonia. The gall resembled that of *Cynips kollari,* but was hollow, the walls being about $\frac{1}{8}$ inch in thickness. The circular door prepared by the larva was about $\frac{1}{8}$ inch in diameter. The pupa was lying free, without any silk cocoon. It was suggested that the insect was perhaps allied to Œcocecis.—Mr. G. H. **Kenrick** communicated a paper entitled "Natural Selection Applied to a Concrete Case."—Mr. J. C. **Kershaw** communicated papers on enemies of butterflies in south China, and a life-history of *Gerydus sinensis.*—Mr. Nelson **Annandale** communicated a paper on the eggs and early stages of a Coreid bug, probably *Dalader acuticosta,* with a note on its hymenopterous parasites.

Royal Microscopical Society, November 16.—Sir Ford North, F.R.S., in the chair.—Mr. Hugh C. **Ross** exhibited and described a new electric warm stage of his invention.—Mr. C. L. **Curties** exhibited two new designs of the Nernst lamp suitable for use with a current of 100 and 200 volts respectively, adapted for use with the microscope, and fitted with ground glass or blue glass fronts and mounted so as to be used at any height or angle required.—A paper on theories of microscopic vision, a vindication of the Abbe theory, which contained some new views on the subject, was read by Mr. **Conrady.**

Linnean Society, November 17.—Prof. W. A. Herdman, F.R.S., president, in the chair.—Mr. H. E. H. **Smedley** exhibited forty-one models of Palæozoic seeds and cones. The models of the seeds show the complexity of their internal structure, whilst the models of the synthetically re-constructed calamitean and other cones display the high organisation of the vascular cryptogams of Palæozoic times.—Note on the shape of the stems of plants: Lord **Avebury.** The author pointed out that while most plants had round stems, in some they were triangular, some quadrangular, &c., but that, so far as he knew, no attempt had been made to explain these differences. He thought they could, however, be accounted for on mechanical principles. In building, when the main object was to meet a strain in one direction, the well known girder was the most economical disposition of material. In a tree-stem it was necessary to resist strain coming from all directions, and the woody tissues acted as a circular series of girders. In herbs with opposite leaves the strains were mainly in two directions, and were met by two opposite girders, thus giving the quadrangular stem. Taking our native flora he showed that all herbs with quadrangular stems had opposite leaves, and as a rule herbs with opposite leaves had quadrangular stems. Sedges had triangular stems and grasses round stems, and while sedges had the leaves in threes, those of grasses were distichous. Pentagonal stems might be accounted for in a similar way, and incidentally this threw light on the petals of so many flowers. Thus plants had adopted, millions of years ago, principles of construction which have gradually been worked out by the skill and science of our architects and engineers.—Observations on some undescribed or little known species of Hemiptera Homoptera of the family Membracidæ: G. Bowdler **Buckton.** Prof. Poulton has explained the significance of the strange forms of some of the Membracidæ by their dependence on environment, and the requirements of mimicry; and the Rev. Canon Fowler has also given information respecting the economics of the species, and their maintenance during the struggle for life. The present paper may be regarded as supplementary to Canon Fowler's work on the Membracidæ in the "Biologia Centrali-Americana," and to Mr. Buckton's monograph, in which latter work an attempt has been made to classify the family so far as at present known. The specific descriptions are chiefly founded on specimens from the museums of Madrid and Brussels. Most of the new species are from Mexico and Central America, six from Africa, and one each from India, Ceylon, Sumatra, and the Philippines. Mr. Buckton then characterises twenty-four new species, five of which are made the types of new genera, and the paper concludes with general observations on the habits, economy, and transformations of the Membracidæ.

Physical Society, November 25.—Dr. R. T. Glazebrook, F.R.S., president, in the chair.—The measurement of small differences of phase: Dr. W. E. **Sumpner.** Hitherto, in order to measure the differences of phase between alternating-current quantities, it has been necessary to use some method involving the simultaneous reading of three deflectional instruments, such as the wattmeter method, or the three-voltmeter method either in its original or in some modified form. These methods cannot be successfully applied when the phase-differences to be determined are small. The author describes new voltmeter methods which may be used for the purpose, and gives the results of a number of measurements on alternating-current plant.—Dr. C. V. **Drysdale** exhibited and described apparatus for the direct determination of the curvatures of small lenses, such as the objectives of microscopes. Parallel light from a distant source falls upon a plane unsilvered mirror inclined at an angle of 45°. Some of the light is reflected and brought to a focus by an ordinary convex lens. The surface to be tested is placed at this point, and the reflected rays proceed as if they had come from a point on the surface. They pass through the plate glass into a telescope focused for parallel rays, and an observer sees an image of the distant source. If the surface is convex and is brought nearer to the lens, then, when it reaches such a position that its centre of curvature is at the focus of the rays emerging from the lens, the light will again retrace its former path and a distinct image of the source will be seen in the telescope. In order to obtain the two images the surface has therefore been moved through a distance equal to its radius of curvature. If the surface is concave it must be moved away from the lens. Dr. Drysdale showed how the method could be carried out by means of an auxiliary piece fitted to an ordinary microscope. He also described a method of testing the spherical and chromatic aberration of microscopic objectives. Light from a distant point is partially reflected by means of a piece of plate-glass down the axis of the microscope. In passing out of the objective it is brought to a focus upon a mirror, and retraces its path along the axis of the instrument until it reaches the plate glass. This it passes through, and by means of a telescope an observer can view the distant source. The light having passed twice through the lens to be investigated, the effects of chromatic and spherical aberration are doubled, and at the same time the effect of coma is eliminated.—Prof. S. P. **Thompson** gave an exhibition of specimens of crystals showing the phenomenon of luminous rings. He said it was well known that when a source of light was viewed through certain samples of calc-spar the field of vision contained two luminous rings each of which passed through the image of the luminous point. The subject had been investigated by Dr. Johnstone Stoney, who had attributed the phenomenon to a minute tubular structure in the crystal. There were, however, certain crystals which when cut in the ordinary way across the axis and used to view a distant source of light exhibited a single luminous ring passing through the image of the source. Looking down the axis of the crystals no ring is visible, but on tilting it a ring can be seen in the direction of the tilt which grows in diameter as the tilt is increased. So far as he knew, no explanation of these phenomena had been offered. At the meeting a piece of calc-spar showing the two rings, and pieces of beryl and tourmaline showing the single ring were exhibited.

Edinburgh.

Royal Society, November 7.—Lord M'Laren in the chair.—In a paper on Prof. Seeliger's theory of temporary stars, Dr. J. **Halm** gave some important extensions bearing especially upon the characteristics of Nova Aurigæ (1892) and Nova Persei (1902). Seeliger's theory, broadly stated, is that a temporary star results from the collision of a dark body with a nebula, the chances of such a collision being much greater than the collision of two dark bodies. A necessary consequence will be an intense superficial heating with an atmospheric expansion in all directions. In whatever direction an observer may be situated, spectroscopic observations will show, (1) a displacement violet-wards of absorption lines or bands due to the absorptive action of the expanding and cooling atmosphere advancing in the direction of the observer with the hotter interior parts of the star as background; and (2) bright bands due to the expanding atmosphere to right and left of the body of the star, there being in this case no brighter background and no spectral shift. Dr. Halm now imagines that the collision is due to the advance of the dark body into a stream of nebulous matter passing obliquely across the dark body's path. This will at once give rise to a circulation of parts of the nebula round the star, and these, of course, will also be highly heated. The portions moving transverse to the line of sight across the face of the star will produce absorption bands in their normal position in the spectrum, while the marginal portions moving on the one side towards the observer and on the other side from him will produce a shift of bright bands both towards the red and towards the violet end of the spectrum. By compounding the effects of these two conditions, namely, the simple expansion of the atmosphere equally in all directions and the swirl of incandescent matter due to oblique collision, Dr. Halm showed that the two types of spectra obtained in the cases of the recent Novæ were at once obtained.—Three papers by Dr. Thomas **Muir** were also communicated, the titles being "The Sum of the Signed Primary Minors of a Determinant," "Continuants Resolved into Linear Factors," and "The Three-line Determinants of a Six-by-Three Array."

November 21.—Lord M'Laren in the chair.—Mr. George **Romanes,** C.E., read a paper on a possible explanation of the formation of the moon. The general idea was that the moon had grown to its present form and size by the gradual agglomeration of what was originally a ring of satellites broadly similar to what we know to exist in the case of Saturn. On this hypothesis it was easily shown that the process of agglomeration of a comparatively small body like the moon could not be accompanied with an evolution of heat sufficient to produce a molten globe, and that in consequence the ordinary assumption of intense volcanic action to explain the so-called craters was difficult to accept. But it seemed possible to account for the rugged mountainous surface of the moon with the "seas," ridges, "craters," and peaks by means of the bombardment of those meteoric masses, large and small, which in virtue of the combined action of moon, earth, and sun were precipitated from time to time upon the lunar surface. In the absence of an atmosphere the masses so precipitated would impinge upon the surface with high enough velocities to render the material in the immediate vicinity liquid, the impinging mass also itself being liquefied wholly or partially according to circumstances. The author entered into a detailed examination of some of the most striking features of the moon's surface, and showed how this hypothesis accounted for them. He also exhibited a mass of lead into which small bullets had been shot at various incidences. The indentations reproduced the leading characteristics of the lunar "craters," even to the small hill in the middle of the main depression. It was also noticed that at the instant of impact the rim of lead thrown up all round was made red hot. The mysterious streaks so characteristic of Tycho in certain aspects were explained as due to great splashes of material which settled down in thin crystalline layers capable of throwing off the reflected sunlight in definite directions.—Prof. **Coker** described a laboratory apparatus for measuring the lateral strains in tension and compression members. By a well designed combination of levers and mirror attachment an apparatus capable of being fixed to the bar itself had been constructed, which was sufficiently rigid and yet sensitive enough to measure a change of 1/20,000th of an inch. Some experiments on steel, iron, and brass bars were described, in which the new apparatus was used in conjunction with Ewing's extensometer, and values of Poisson's ratio were given to three significant figures. The values varied from one-third to one-fourth.

Paris.

Academy of Sciences, November 28.—M. Mascart in the chair.—On the possibility of chemical reactions: M. **de Forcrand.** The author contends that the rigid application of the thermodynamical condition of the possibility of a chemical reaction is neither practical nor necessary, and that the empirical rule that the disengagement of heat settles the course of a reaction is the only possible experimental criterion of the possibility of chemical reactions.—On the prediction of chemical reactions: M. **de Forcrand.** In general, accurate prediction of the course of a chemical reaction is impossible, but there are two rules or principles, one rigorous the other approximate. The latter, the principle of maximum work, is a simplification of the first, and ought to be considered as the only practical guide.—M. Dastre was elected a member in the section of medicine and surgery in the place of the late M. Marey.—The Leonids in 1904: Lucien **Libert.** Details of observations made at Havre on the nights of November 14, 15, and 15, 16. 111 meteors were observed and the trajectories measured.—On the singularities of uniform analytical functions: D. **Pompeiu.**—On a new class of ions: G. **Moureau.** In a previous paper it has been shown that a saline vapour becomes conducting after passing through a porcelain tube heated to about 1000° C., and remains conducting at much lower temperatures, possessing the properties of an ionised gas. In the present paper the mobilities of these new ions have been measured. It was found that in the neighbourhood of the region of ionisation the mobilities of the vapours are of the same order as the ions of the gases issuing from a flame.—On the genesis of temporary radio-activity: Ed. **Sarasin,** Th. **Tommasina,** and F. J. **Micheli.** The authors conclude from the results of their work that a very close relation appears to exist between ionisation and the production of temporary radio-activity. The two phenomena would appear to be reversible, the production of the temporary radio-activity of a body being due to the absorption, or, perhaps, adsorption of an emanation which is formed during the ionisation of a gas. On this view, the radio-activity would consist in the loss by radiation of the emanation adhering to radio-active bodies, this causing, in its turn, the ionisation of a gas.—Stereoscopy without a stereoscope: A. **Berthier.** The author points out that he has already published a description of a method similar in principle to that given by M. Ives in the *Comptes rendus* of October 24 last.—On the colloidal state of matter: G. E. **Malfitano.** The author regards colloidal matter as a system formed of an electrolyte dissociated into ions and insoluble molecules grouped round these ions.—The influence exerted by the removal of the moisture from the air supplied to the blast furnace: A. **Lodin.** The results obtained by Gailey at the Isabella blast furnaces, near Pittsburg, on the effect of drying the air forced into the furnace, have attracted much attention in Europe, not unmixed with scepticism. The author makes a comparison of the heat balances in the two cases, and shows where the economy is effected. One indirect effect of the drying process is to increase the temperature of the ingoing air, and a considerable portion of the economy effected may be attributed to this cause. In Europe, where it is usual to work with the air entering the tuyeres at a much higher temperature than at the Isabella furnaces, the relative economy which would be produced by drying the air would be too small to justify the capital expenditure required to introduce the necessary plant.—On the use of dry air in blast furnaces: Henri **Le Chatelier.** The economy claimed for the use of dry air is ascribed by the inventor of the process to the fact that the moisture of the undried air transforms a certain proportion of the coke into hydrogen and oxide of carbon. From the figures of the amount of water removed it is possible to calculate exactly this loss; it is 5 per cent., or only one-fourth of the amount claimed. It is certain, then, either that the economy claimed is incorrect, or else that the true cause is to be sought for elsewhere. The author shows that the quality of the iron produced, especially as regards its sulphur impurity, is an important factor, and that when the sulphur is to be kept down to a certain percentage the economy of fuel claimed by Gailey may be real.—On wood spirit from *Thuya articulata,* Algeria: Emilien **Grimal.** Carvacrol, thymohydroquinone, and thymoquinone were isolated from the product of the distillation of this wood with steam.—The formation and distribution of the essential oil in an annual plant: Eug. **Charabot** and G. **Laloue.** During the formation of the flower the increase of essential oil by the flower corresponds to a loss of oil by the green parts. After the seed is formed, and there is no longer a flow of nutritive principles towards the flower, the essential oil returns to the green organs.—Floral abnormalities produced by parasites acting at a distance: Marin **Molliard.** The atrophy of the stamens, and the conversion of the sepals, petals, and carpels into green foliaceous leaves, a phenomenon frequently met with in *Trifolium repens*, is shown to be due to the burrowing of a larva (probably of *Hylastinus obscurus*) at the base of the stem of the plant.—*Xylotrechus quadrupes* and its ravages on the coffee plant of Tonkin: L. **Boutan.**—The individuality of the complex particle in a crystal: M. **Wallerant.**—On the lakes of the Grimsel and of the St. Gothard massif: André **Delebecque.**—The degree of saline concentration of the blood serum of the eel in sea water and in fresh water, after its experimental passage from the former to the latter: René **Quinton.** The percentage of salt in the blood serum of the eel varies in accordance with the degree of salinity of the water in which it is placed, and is an example of the fact that the saline concentration of fresh water fishes is that of their marine ancestors, reduced simply by the influence of the new medium in which they live.—The elimination of urea in healthy subjects: H. **Labbé** and E. **Morchoisne.**—Contribution to the study of acid dyscrasia: A. **Desgrez** and J. **Adler.**—On the bleaching of flour: E. **Fleurent.**

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 8.

ROYAL SOCIETY, at 4.30.—Memoir on the Theory of the Partitions of Numbers. Part III: Major P. A. MacMahon, F.R.S.—Note on a Means of Producing a High-voltage Continuous or "Pertinacious" Current: Sir Oliver Lodge, F.R.S.—The Effect of Liquid Air Temperatures on the Mechanical and other Properties of Iron and its Alloys: Sir James Dewar, F.R.S., and R. A. Hadfield.—The *Rôle* of Diffusion during Catalysis by Colloidal Metals and Similar Substances: Dr. H. J. S. Sand.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Notes on Portland Cement: H. E. Bellamy.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Hydrodynamical and Electromagnetic Investigations regarding the Magnetic-Flux Distribution in Toothed-Core Armatures: Prof. H. S. Hele-Shaw, F.R.S., Dr. A. Hay, and P. H. Powell. (Conclusion of Discussion).—Studies in Magnetic Testing: G. F. C. Searle.

SOCIETY OF ARTS, at 4.30.—Burma: Sir Frederic Fryer, K.C.S.I.

MATHEMATICAL SOCIETY, at 5.30.—On Groups of Order $p^\alpha q^\beta$: Prof. W. Burnside.—On the Linear Differential Equation of the Second Order: Prof. A. C. Dixon.—On a Deficient Multinomial Expansion: Major P. A. MacMahon.—The Application of Basic Numbers to Bessel's and Legendre's Functions (second paper): Rev. F. H. Jackson.—On the Failure of Convergence of Fourier's Series: Dr. E. W. Hobson.—An Extension of Borel's Exponential Method of Summation of Divergent Series Applied to Linear Differential Equations: E. Cunningham.

FRIDAY, DECEMBER 9.

ROYAL ASTRONOMICAL SOCIETY, at 5.—(1) Dark Nebulosities; (2) Detached Nebula in Cygnus: W. S. Franks.—On the Relative Brightness of Binary Stars: J. E. Gore.—(1) On the Completion of the Main Problem in the New Lunar Theory; (2) The Final Values of the Coefficients in the New Lunar Theory: Prof. E. W. Brown.—On the Relative efficiency of Different Methods of Determining Longitudes on Jupiter: A. Stanley Williams.—On the Temperature of Sun-spots, and on the Spectrum of an Artificial One: W. E. Wilson.—On the Validity of Meteor Radiants deduced from Three Tracks: H. W. Chapman.—*Promised papers*:—Observations of the Leonid Meteors of 1904 November: Royal Observatory, Greenwich.—Radio-activity of Matter the Possible Cause of Heat Energy in Sun and Stars: W. E. Wilson.—Mean Areas and Heliographic Latitudes of Sun-spots in the Year 1903: Royal Observatory, Greenwich.—The Coefficients of 145 Terms in the Moon's Longitude derived from Greenwich Meridian Observations, 1750–1901: P. H. Cowell.

EPIDEMIOLOGICAL SOCIETY, at 8.30.—Ticks and Tick-transmitted Diseases: Dr. Nuttall, F.R.S.

MALACOLOGICAL SOCIETY, at 8.—Description of a new species of Trachiopsis from British New Guinea: H. B. Preston.—A Correction in Nomenclature: E. A. Smith.—Notes on the American Cyclostomatidæ and their Opercula: W. H. Dall.—Note on the Dates of Publication of the Various Parts of Moquin-Tandon's "Hist. Moll. terr. fluv. de France": J. W. Taylor.

PHYSICAL SOCIETY, at 8.—On a Rapid Method of Approximate Harmonic Analysis: Prof. S. P. Thompson, F.R.S.—A High-Frequency Alternator: W. Duddell.—Exhibition of Experiments to show the Retardation of the Signalling Current on 3500 miles of the Pacific Cable between Vancouver and Fanning Island.—Exhibit of Ayrton-Mather Galvanometers, Universal Shunts, and Electrostatic Instruments.

MONDAY, DECEMBER 12.

SOCIETY OF ARTS, at 8.—Musical Wind Instruments, Reed Instruments: D. J. Blaikley.

SOCIETY OF DYERS AND COLOURISTS, at 8.—Bleaching Agents: and the Methods of Application: F. W. Walker.—The Application of Sulphide Colours in the Dyeing of Chrome Leather.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Explorations in Bolivia: Dr. H. Hoek.

TUESDAY, DECEMBER 13.

ZOOLOGICAL SOCIETY, at 8.30.—Some Notes on Anthropoid Apes: Hon. Walter Rothschild.—On the Cranial Osteology of the Clupeoid Fishes: Dr. W. G. Ridewood.—The Characters and Synonymy of the British Species of Leucosolenia: Prof. E. A. Minchin.

SOCIOLOGICAL SOCIETY, at 8.—The School in Some of its Relations to Social Organisation and to National Life: Prof. M. E. Sadler.

INSTITUTION OF CIVIL ENGINEERS, at 8.—On the Construction of a Concrete Railway-Viaduct: A. Wood-Hill and E. D. Pain.

WEDNESDAY, DECEMBER 14.

CHEMICAL SOCIETY, at 5.30.—Hydrolysis of Ammonium Salts. V. H. Veley.—The Viscosity of Liquid Mixtures. Part ii.: A. E. Dunstan.—The Diazo-reaction in the Diphenyl Series. Part ii.: Ethoxybenzidine: J. C. Cain.—The Sulphate and the Phosphate of the Dimercurammonium Series: P. C. Rây.—A Method for the Direct Production of certain Aminoazo-compounds: R. Meldola and L. Eynon.

SOCIETY OF ARTS, at 8.—The Patent Laws: C. D. Abel.

THURSDAY, DECEMBER 15.

ROYAL SOCIETY, at 4.30.—*Probable Papers*:—An Analysis of the Results from the Falmouth Magnetographs on "Quiet" Days during the Twelve Years 1891 to 1902: Dr. C. Chree, F.R.S.—The Halogen Hydrides as Conducting Solvents. Part iii.: B. D. Steele.—The Halogen Hydrides as Conducting Solvents. Part iv.: B. D. Steele, D. McIntosh, and E. H. Archibald.—Effects of Temperature and Pressure on the Thermal Conductivities of Solids. Part i., The Effect of Temperature on the Thermal Conductivities of some Electrical Insulators: Dr. C. H. Lees.—The Basic Gamma Function and the Elliptic Functions: Rev. F. H. Jackson.—On the Normal Series satisfying Linear Differential Equations: E. Cunningham.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Discussion on Mr. Searle's Paper, Studies in Magnetic Testing; Followed by The Combination of Dust Destructors and Electricity Works, Economically Considered: W. P. Adams.

LINNEAN SOCIETY, at 8.—The Ecology of Woodland Plants: Dr. T. W. Woodhead.—Experimental Studies on Heredity in Rabbits: C. C. Hurst.

FRIDAY, DECEMBER 16.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Heat Treatment Experiments with Chrome-Vanadium Steel: Capt. H. Riall Sankey and J. Kent-Smith.—Messrs. Seaton and Jude's Paper on Impact Tests on the Wrought Steels of Commerce will be further discussed.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Folkestone Harbour: Cylinder-Sinking at the Root of the Old Pier: R. H. Lee Pennell.

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